

## Extrapolation of the FOM 1MW Free Electron Maser to a 5MW Plasma Heating Source\*

*M. Caplan\**, *M. Valentini\**, *A. Verhoeven,\*\**, *W. Urbanus\*\**,  
*A. Tulupov\*\*\**

*\*Lawrence Livermore National Laboratory, Livermore, CA U.S.A.*

*\*\*FOM Instituut voor Plasma Physica, Rijnhuizen, The Netherlands*

*\*\*\*Soliton-NTT Research Centre, Moscow, Russia, 105025*

A Free Electron Maser (FEM) is now under test at the FOM Institute (Rijnhuizen) Netherlands with the goal of producing 1MW long pulse to CW microwave output in the range 130 GHz-250 GHz with 50% wall plug efficiency <sup>(1)</sup>. The key concepts incorporated in this design are:

- (1) conventional 2MeV DC accelerator system with depressed collector;
- (2) step corrugated waveguide for power handling and beam-RF separation;
- (3) low emittance electron gun with halo suppression;
- (4) step tapered wiggler circuit design;
- (5) periodic magnet side array focusing;
- (6) low current loss solenoid focused beam line system;
- (7) Brewster Angle output window (Diamond).

Since all key design features are applicable to much higher powers, we are investigating FEM designs capable of delivering up to 5MW CW power in order to greatly reduce the cost per kilowatt thus providing a practical plasma heating source.

Performance predictions for a 5MW device are presented with particular attention to issues of beam transmission and mode competition. <sup>(2)</sup>

- (1) Urbanus et al, "Design of the 1MW, 200 GHz FOM Fusion FEM, Nuclear Instruments and Methods" A331 (1993) 235-240, North Holland.
- (2) Caplan, et al, "Predicted Operating Conditions for Maintaining Mode Purity in the 1MW 200 GHz FOM FEM, Nuclear Instruments and Methods A358 (1995) 174-177.

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